

PACOM ENERGY INITIATIVES (U)



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Overview

- **Strategies**
 - **PACOM Energy Strategy in Cooperation with Hawaii**
 - **PACOM Energy Security Strategy**
 - **PACOM Green Initiative for Fuels Transition (GIFTPAC) biofuel strategy**
- **Funded Energy Projects**
- **PACOM Energy Program for the 21st Century (PEP21)**
- **Federal Energy Management Program (FEMP) Support**
- **Energy Experimentation**
- **Questions**



PACOM Energy Strategy in Cooperation with the State of Hawaii

Vision Statement:

“USPACOM, in cooperation with the State of Hawaii, will develop key strategies and implement innovative solutions to harness clean, efficient, secure, renewable and sustainable energy for the benefit of the people of Hawaii and the Asia Pacific Region.”

- **Strategic Goal:**
“Match or exceed the State of Hawaii goals.”
- **Five Goals**
 1. **Minimize dependence on fossil fuels**
 2. **Develop renewable energy resources**
 3. **Reduce greenhouse gas emissions**
 4. **Emphasize sustainability**
 5. **Exercise leadership**



PACOM Energy Strategy in Support of HCEI

- **Minimize dependence on fossil fuels**
 - **Reduce power consumption**
 - **Reduce consumption at least 3% per yr and 30% by 2015**
 - **Reduce petroleum use in ground transportation**
 - **Reduce non-tactical vehicle fossil fuel consumption 2%/yr**
- **Develop renewable energy resources**
 - **Maximize clean alternative energy**
 - **10% renewable by 2010, 15% by 2015, 25% by 2020, 40% by 2030**
 - **100% of new on-base distributed generation electricity will be renewable with the following exceptions:**
 - **Fuel fired electric plants will be biofuel capable and will use biofuel when feasible**
 - **Tactical and mobile electrical generating systems are excluded**



PACOM Energy Strategy in Support of HCEI

- **Reduce greenhouse gas emissions**
 - **Meet or exceed all federal goals and assist the State of Hawaii in meeting their goals**

- **Emphasize sustainability**
 - **Design new buildings to use 30% less energy**
 - **Design new buildings such that fossil fuel-generated energy consumption is reduced 55% by 2010, 65% by 2015, 80% by 2020, 90% by 2025, and 100% by 2030 (2003 baseline)**
 - **Design new buildings 30% better than ASHRAE standards**
 - **Design major facility renovations to use 20% less energy**
 - **Ensure 15% of facilities meet the Federal Leadership in High Performance and Sustainable Buildings MOU by 2015**
 - **All new construction/major renovation will be LEED Silver**



PACOM Energy Strategy in Support of HCEI

- **Exercise leadership**
 - **Establish a replicable model for the Pacific**
 - **Increase energy security**
 - **Protect 100% of Task Critical Assets**
 - **Take steps to “island” 100% of Hawaii installations**
 - **Schofield Barracks**
 - **Kaneohe Marine Corps Base Hawaii**
 - **Pearl/Hickam Joint Base**
 - **Camp Smith**
 - **Pacific Missile Range Facility, Kauai**
 - **Implement demonstration projects**
 - **Improve technical education outreach to the local schools**
 - **Increase our collective knowledge of energy**



PACOM Energy Security Strategy

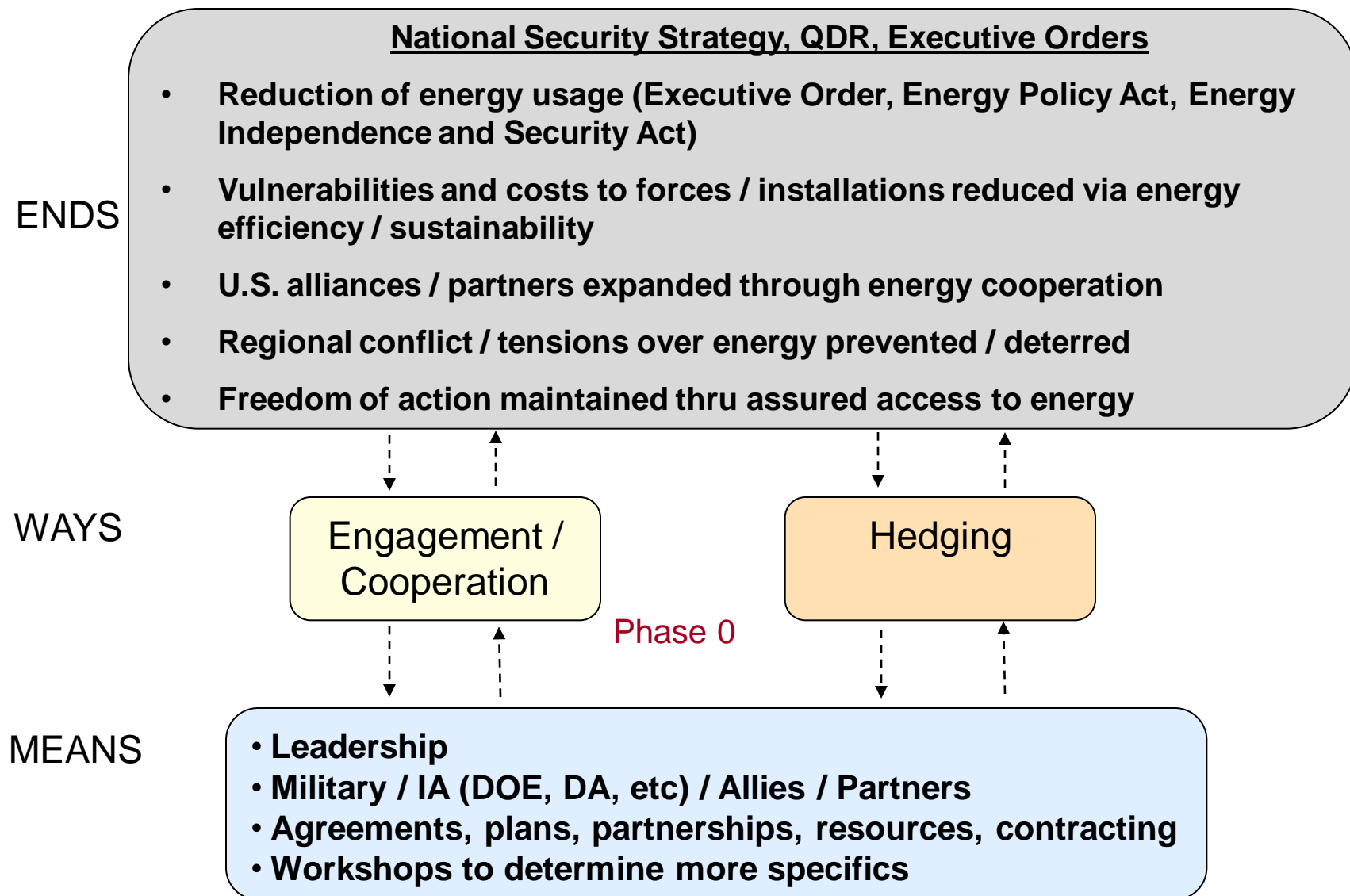
- **Developing Energy Security Strategy via four workshops**
 - **Mar 2010: Developed strategic themes based on higher-level guidance**
 - **Ongoing installation VTCs are developing installation-level goals**
 - 1. Increase energy efficiency**
 - 2. Develop renewable energy resources**
 - 3. Reduce greenhouse gas emissions**
 - 4. Emphasize sustainability**
 - 5. Exercise leadership**
 - 6. Explore innovation in advancing energy security**
 - 7. Establish cooperative initiatives with host governments**

Vision (PACOM Energy Partnership and Strategy Council):

“USPACOM will lead the DoD in developing and implementing a regional energy security, energy independence, and energy efficiency strategy for the benefit of the nation, our people, our Pacific partners, and for the stability of the Asia-Pacific region.”



Energy Security Strategy Framework





Energy Security Strategic Design

Lines of Operation

Strategic Themes

Endstates

*Transform operational
and installation energy
posture*

Reduce installation energy consumption, fossil fuel usage and greenhouse gas emissions

Support sustainable Asia-Pacific energy concepts, strategies and alternative energy technologies

Reduction of energy usage (Executive Order, EPACT, EISA)

Vulnerabilities and costs to forces / installations reduced via energy efficiency / sustainability

Enhance security/stability

Enable enduring energy security, stability and sustainability

Ensure regional access to energy supplies

U.S. alliances / partnerships expanded through energy cooperation and integration
Regional conflict / tensions over energy prevented / avoided

Assure


Meet operational energy requirements

Freedom of action maintained thru assured access to energy



Way Ahead

- **Develop / Refine / Validate ways, means and metrics**
 - **Next workshop is planned at the Naval Postgraduate School in the late-June timeframe**
 - **Anticipate involving about 30 to 40 participants from USPACOM and various security institutions (WOG)**
 - **Follow-on workshops to address ends as needed**
 - **Anticipate three additional workshops, last culminating in Washington DC (WOG buy-in)**
 - **Write / coordinate / publish “Energy Security Strategy for Asia-Pacific Region” by Nov 2010**



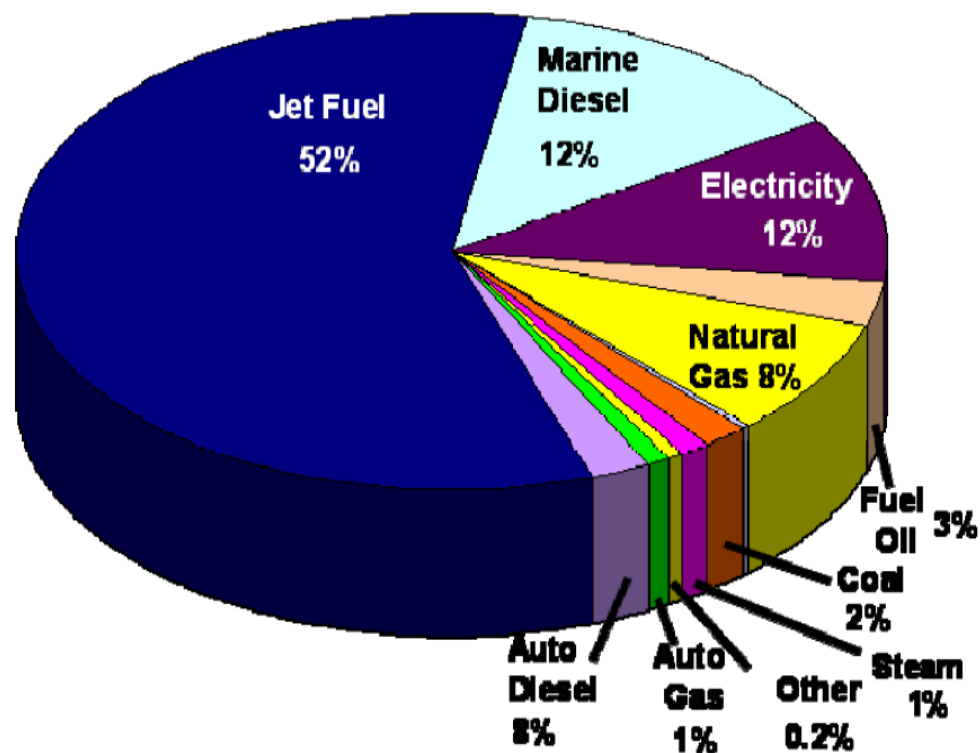
PACOM Green Initiative for Fuels Transition (GIFTPAC) - Objectives

- 1) Long-term contract by DESC for multi-year stable-price supply of locally-produced green MILSPEC fuel to displace at least 25% of DoD petroleum-based supply in Hawaii; corresponding purchase contracts of renewable/green electricity derived from co-products of jet fuel process.
- 2) Enterprise model inclusive of the local energy market that incorporates the agricultural, energy, environmental, government, industrial, and commercial sustainability objectives.
- 3) End state with sustainable ongoing competition between multiple commercial entities in Hawaii at multiple levels.



GIFTPAC Problem Statement: Jet Fuel

- Jet fuel comprises the majority of DoD energy use
- Jet fuel makes up a large share of total energy use in Hawaii
 - 5x more jet fuel use per capita than national average
- Jet fuel has no easy replacements
 - No additives or substitutes that can displace gasoline or diesel use (e.g. ethanol, biodiesel)



Percent of FY06 Total DoD Energy Use



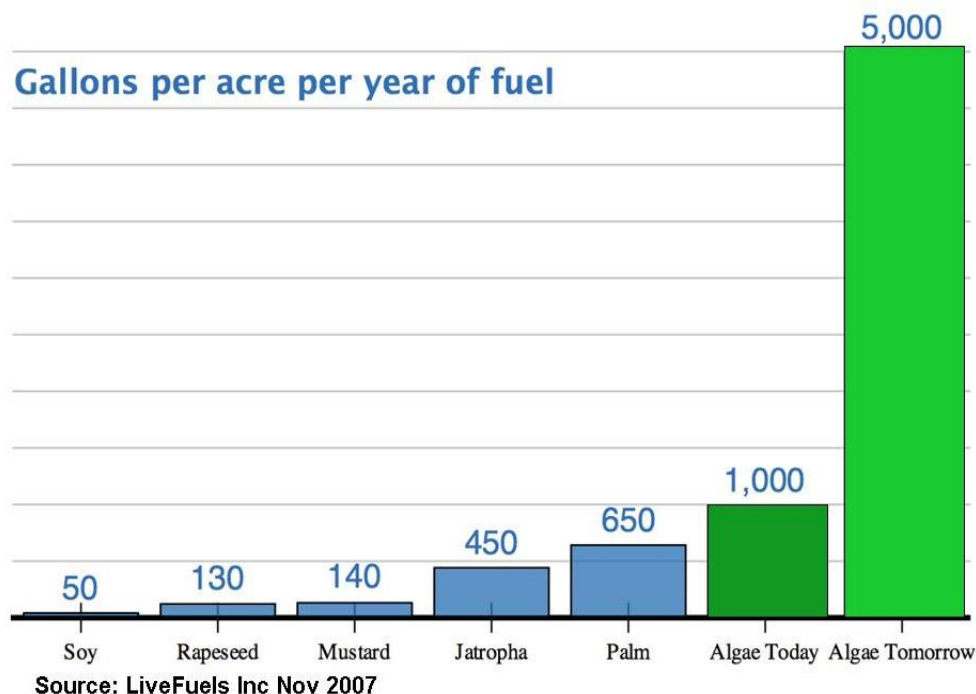
Potential Solution: Algae Bio-oil

• Advantages of Algae Oil:

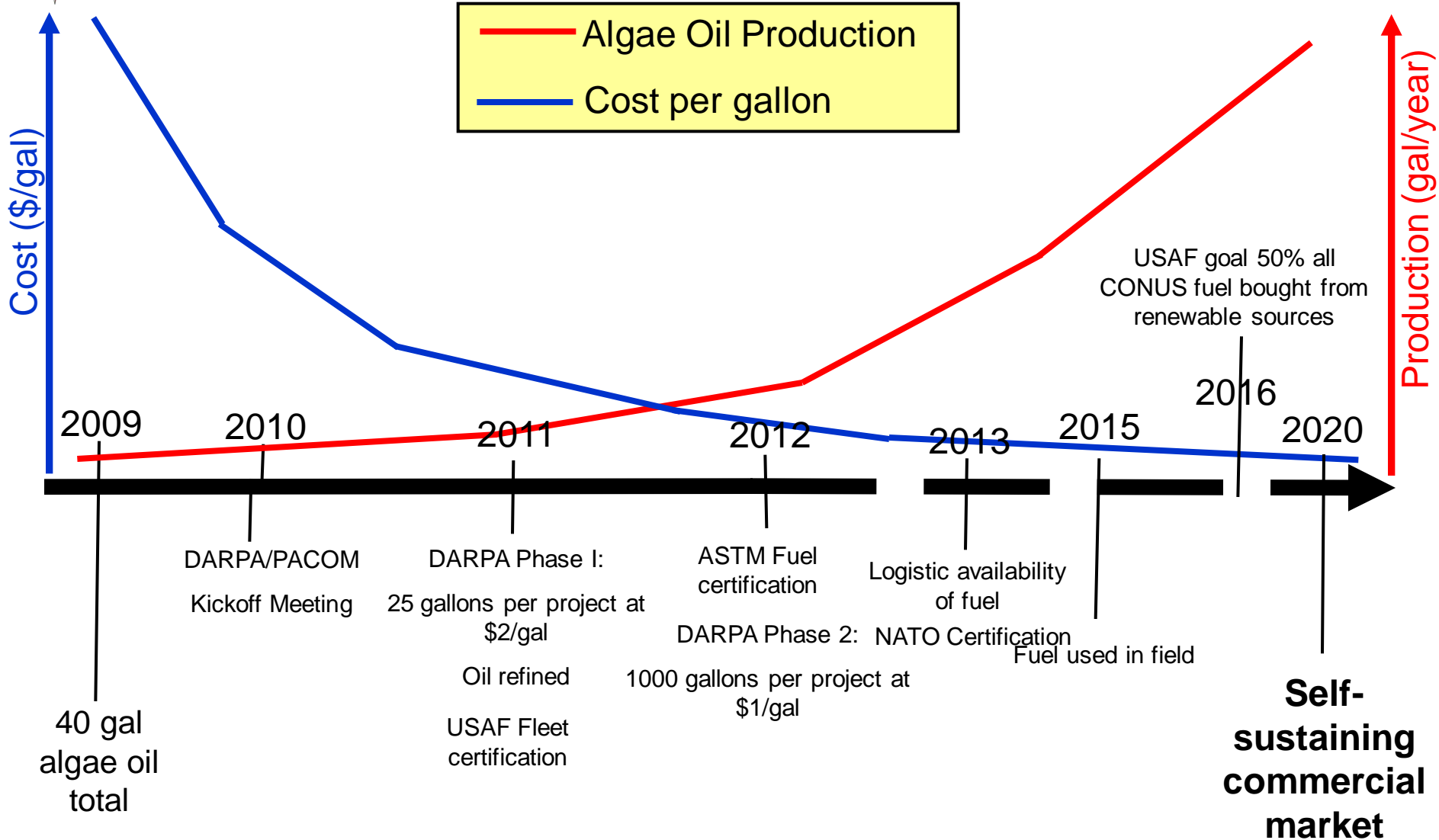
- Can produce locally grown jet fuel and other refined petroleum products
 - Long carbon chain oil
- Does not compete with food crops for resources
 - No potable water required
 - Can grow in brackish or waste water
 - Can use marginal land
- High oil productivity per acre
 - Fast growth rate
 - High percentage of plant is oil
- Photosynthetic
 - Main inputs are sunlight and CO₂
 - **Algae is a net carbon absorber—good for the environment**

• Risks of Algae Oil:

- Scale for energy needs to be 1000-100,000 times greater than current commercial production
- High capital cost (\$10,000/acre) relative to agriculture
- Difficulty of extracting oil from an organism 10 microns in diameter



What should the Timeline and Milestones be?





Recent PACOM Energy Projects

- **6.8 MW photovoltaic (PV) project on roofs of Army family housing units in Hawaii**
- **64 KW rooftop PV project on 2 buildings at Kaneohe Marine Corps Base, HI**
- **309 KW PV project on a hangar roof at Ford Island, HI**
- **250 KW molten carbonate fuel cell at Pacific Missile Range Facility (PMRF) Kauai, HI**
- **Fuel cell hybrid vehicles & experimental prototype hydrogen fuel station powered by 120 KW solar array at Hickam AFB, HI**



Rooftop PV K-Bay



Hydrogen fuel station - Hickam



Recent PACOM Energy Projects (cont.)

- Installation of solar water carports at Pearl Harbor (\$2M project)
- Solar hot water for dorms and rooftop PV for Intermediate Maintenance Facility (\$3M project) at Pearl Harbor, HI
- Upgrade PACAF Hq building lighting and controls (\$1.1M)
- Solar hot water systems on privatized homes, fitness centers, dorms, etc.
- 40 KW wave energy “PowerBuoy” experimental prototype in Kaneohe Bay
- Netzero MCBH Hawaii CO’s house



Wave energy generating
“PowerBuoy” – Kaneohe Bay



Funded PACOM Energy Projects - ARRA

- Rooftop PV project, Pearl Harbor & Barking Sands (\$32M)
- Energy efficiency projects, Schofield & Wheeler (\$21M)
- New roofs and rooftop PV, Schofield & Wheeler (\$13.2M)
- Repair windows etc., Kaneohe MCB Hawaii (\$3.4M)
- Solar water heaters, Ft Shafter (\$1.4M)
- Range control wind/solar system, Kahuku Range (\$750K)
- Repair lighting, energy efficiency upgrades, Hickam (\$303K)
- Solar powered security lights, Schofield Barracks (\$91K)
- Solar heating systems, Schofield Barracks (\$83K)

Total = \$72.2M



PEP21 - Hawaii

• PACOM Energy Program for the 21st Century (PEP21)

Consisting of 3 separate energy packages

- Energy Efficiency Package**
- Energy Security Package**
- Renewable Energy Package**

• Total Cost: ~ \$1.675B

• Impact:

- 80% reduction in fossil fuel for electricity**
- 34% reduction in total DoD electric demand in Hawaii**
- 15% reduction in ground transportation fuel**
- 5,000 jobs created**
- Saves \$42M per year in electric costs**
- Reduces CO2 emissions by 1,140,000 tons per yr**



FEMP Support



U.S. Department of Energy

Energy Efficiency and Renewable Energy

Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Major Funding Areas

Facility Assessments	\$1,950,000
Micro Grids & L.S. Renewables	\$615,000
Energy Manager Training	\$597,000
Integration, Tracking, Reporting	<u>\$250,000</u>
Total Funding	\$3,222,000*

*Some additional activities may be funded with FY 2010 and 2009 operating funds to the extent they are consistent with existing budget priorities.



Joint Experiments

1. Energy Efficient Data Center Experiment – FY10 & FY11

- **Data centers represent 1.5% of energy consumption in the U.S.**
- **10% of data center usage is federal, costing govt \$450M**
- **Data center power consumption doubled from 2000-2006**
- **Inefficient - 50% goes to powering equipment, 50% to cooling**
- **State-of-the art energy efficient servers and data centers can reduce power consumption by as much as 80% (EPA)**
- **Partnering with MARFORPAC Experimentation Center (MEC), DISA and NAVFAC and Lawrence Berkeley Lab to experiment on the DISA Defense Enterprise Computing Center**
 - **Advanced metering**
 - **Baseline data collection**
 - **Hot/cold aisle containment**
 - **Server virtualization**
 - **Energy efficient windows**
 - **Upgraded ventilation, chillers**



DISA DECC Pacific, host of the data center experiment



Joint Experiments (cont)

2. Spray Foam Insulation Experiment – FY09 & FY10

- **OSD Power Surety Task Force (PSTF) has had great success with spray foam insulation in desert environment – energy savings up to 60%**
- **Texas A&M University installed \$7M sq ft of insulation in the 1980s with payback in 4.5 yrs & virtually no maintenance costs**
- **Need to test it in Hawaii's climate**
- **Partnering with Sandia National Lab, PSTF, Hawaii ANG, Hickam AFB, Forest City and Kaneohe MCBH**



Forest City military housing duplex at Kaneohe MCBH



Guard bldg on Hickam with spray foam insulation on roof



Joint Experiments (cont)

3. Liquid Desiccant Solar Ventilation A/C Experiment - FY10 & FY11

- **To be tested at MCBH Kaneohe**
- **New technology that could reduce cooling costs in humid climates as much as 30%**
- **Developed by DOE's National Renewable Energy Lab (NREL) in conjunction with commercial developer**





Joint Experiments (cont) - SPIDERS

4. Proposed Joint Capability Technology Demonstration (JCTD) on Energy Security – FY11 start

- **Will demonstrate**
 - 1. Cyber defense**
 - 2. Smart grids**
 - 3. On 3 military installations**
- **Partners**
 - NORTHCOM, DOE, DHS, OSD, HECO, State of Hawaii**
- **Nicknamed SPIDERS: Smart Power Infrastructure Demonstration for Energy Reliability and Security**
- **Problem: The joint warfighter's ability to command, control, deploy, and sustain forces is adversely impacted by a fragile, aging, and fossil fuel dependent electricity grid that makes our military installations, and their critical infrastructure, vulnerable to incident, whether natural event or deliberate attack, posing a significant threat to national security**





Expected SPIDERS Outcome

STAIRWAY TO ENERGY SECURE INSTALLATIONS

Year 1

HICKAM AFB CIRCUIT LEVEL DEMO

- Renewables
- Hydrogen Storage
- Hydrogen Fuel Cell
- Energy Management
- VSE SCADA Test at Idaho National Lab

Year 2

FT CARSON MICRO-GRID

- Large Scale Renewables
- Vehicle-to-Grid
- Smart Micro-Grid
- Critical Assets
- CONUS Homeland Defense Demo
- COOP Exercise

Year 3

CAMP SMITH ENERGY ISLAND

- Entire Installation Smart Micro-Grid
- Islanded Installation
- High Penetration of Renewables
- Demand-Side Management
- Redundant Backup Power
- Makana Pahili Hurricane Exercise

TRANSITION

- Template for DoD-wide implementation
- CONOPS
- TTPs
- Training Plans
- DoD Adds Specs to GSA Schedule
- Transition to Commercial Sector
- Transition Cyber-Security to Federal Sector and Utilities

VIRTUAL SECURE ENCLAVE (VSE) CYBER-SECURITY

RIGOROUS ASSESSMENT WITH RED TEAMING IN EACH PHASE



Overview of PACOM Energy Strategies & Initiatives

